CLAIMS

1. Apparatus for transmitting information at a data rate, comprising:
a pulsed light source that produces pulsed light having a pulsed repetition rate; and
a modulator that asynchronously modulates the pulsed light at the data rate,
wherein the data rate is higher than pulse repetition rate.

2. Apparatus according to claim 1 wherein the pulsed light source is a line source and wherein the modulator spatially modulates the line.

3. Apparatus according to claim 2 wherein the modulator independently modulates different sections of the line at the data rate.

4. Apparatus according to claim 1 wherein the pulsed light comprises a laser beam.

5. Apparatus for recording an image on a photosensitive surface, comprising:
a pulsed light source that produces pulsed light having a pulsed repetition rate;
a modulator that modulates the pulsed light at a data rate; and
a scanner that scans the modulated pulsed light over the surface,
wherein the data rate is higher than the pulse repetition rate.

6. Apparatus according to claim 5 wherein the pulsed light source is a line source and wherein the modulator spatially modulates the line.

7. Apparatus according to claim 6 wherein the modulator independently modulates different sections of the line at the data rate.

8. Apparatus according to claim 5 wherein the modulation is asynchronous with the pulses.

9. Apparatus according to claim 5 wherein:

the modulator selectably modulates portions of the beam, wherein said portions are delivered pulse by pulse to spatially overlapping regions of a photosensitive surface to build up a pixelized pattern.

10. Apparatus according to claim 5 wherein the modulated light scans over the surface in a first direction and wherein the surface moves in a direction perpendicular to the direction of scanning such that the surface is illuminated by a raster scan.

11. Apparatus according to claim 5 wherein the photosensitive surface is a photoresist.

12. Apparatus according to claim 5 wherein the pulsed light comprises a laser beam.

13. Apparatus according to claim 5 wherein the pulsed light is produced utilizing a pulsed light generator comprising:

a beam generator that produces an initial pulsed light beam having an initial pulse repetition rate; and

a pulse repetition rate multiplier, which receives the initial pulsed light beam and produces at least one pulsed light beam having a higher pulse repetition rate than the initial rate.

14. Apparatus according to claim 13 and including a second repetition rate multiplier that receives an output beam from the repetition rate multiplier and produces an output beam having a repetition rate higher than the repetition rate of the beam that it receives.

15. Apparatus according to claim 13 wherein the first repetition rate multiplier and the second multiplication rate multiplier each double the repetition rate.

16. Apparatus according to claim 13 wherein the increased pulse repetition rate is twice the initial pulse rate.

17. Apparatus according to claim 13 wherein the increased pulse repetition rate is three times the initial pulse rate.

18. Apparatus according to claim 13 wherein the increased pulse repetition rate is four times the initial pulse rate.

19. Apparatus according to claim 13 wherein the increased pulse repetition rate is greater than four times the initial pulse rate.

20. Apparatus according to claim 13 wherein the pulsed light beam generator generates a laser beam.

21. Apparatus according to claim 20 wherein the laser beam generator comprises:
a pulsed laser operating at an initial laser frequency;
a laser frequency converter that increases the laser frequency to produce the light beam.

22. Apparatus according to claim 21 wherein the pulsed laser comprises a mode locked laser.

23. Apparatus according to claim 21 wherein the pulsed laser is an infrared laser.

24. Apparatus according to claim 23, wherein the light beam is a UV laser beam.

25. Apparatus according to claim 23 wherein the power contained in the higher repetition rate pulses is substantially equal to the power of the initial pulsed light beam.

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26. A method for transmitting information at a data rate comprising:
providing pulsed light that is pulsed at a pulse repetition rate; and
asynchronously modulating the pulsed light at the data rate,
wherein the data rate is lower then the pulse repetition rate.

27. A method according to claim 26 wherein the pulsed light source is a line source and wherein modulating comprises spatially modulating the line.

28. A method according to claim 27 wherein different sections of the line are independently modulated at the data rate.

29. A method for recording an image on a photosensitive surface, comprising:
providing pulsed light that is pulsed at a repetition rate;
modulating the pulsed light at a data rate; and
scanning the modulated pulsed light over the surface
wherein the data rate is higher than pulse repetition rate.

30. A method according to claim 29 wherein the pulsed light source is a line source and wherein modulating comprises spatially modulating the line.

31. A method according to claim 30 wherein different sections of the line are independently modulated at the data rate.

32. A method according to claim 29 wherein the modulation is asynchronous with the pulses.

33. A method to claim 29 wherein the modulated light scans over the surface in a first direction and wherein the surface moves in a direction perpendicular to the direction of scanning such that the surface is illuminated by a raster scan.

34. A method according to claim 29 wherein the photosensitive surface is a photoresist.

35. A method according to claim 29 wherein the pulsed light comprises a laser beam.

36. A method according to claim 29 wherein providing the pulsed light comprises:
generating an initial pulsed light beam having an initial pulse repetition rate; and
multiplying the initial pulse to produce at least one pulsed light beam having a higher pulse repetition rate than the initial rate.

37. A method according to claim 36 and including further multiplying the at least one pulsed light beam to produce an output beam having a repetition rate higher than the repetition rate of the at least one pulsed light beam.

38. A method according to claim 37 wherein multiplying and further multiplying each double the repetition rate.

39. A method according to claim 36 wherein the increased pulse repetition rate is twice the initial pulse rate.

40. A method according to claim 36 wherein the increased pulse repetition rate is three times the initial pulse rate.

41. A method according to claim 36 wherein the increased pulse repetition rate is four times the initial pulse rate.

42. A method according to claim 36 wherein the increased pulse repetition rate is greater than four times the initial pulse rate.

43. A method according to claim 36 wherein the pulsed light beam is a laser beam.

44. A method according to claim 43 wherein providing the pulsed laser beam comprises:
providing a pulsed laser that produces initial laser pulses at an initial laser frequency;
converting the laser frequency to a higher frequency to produce the light beam.

45. A method according to claim 43 wherein the pulsed laser comprises a mode locked laser.

46. A method according to claim 44 wherein the initial pulses are in the infra-red.

47. A method according to claim 36, wherein the light beam is a UV laser beam.

48. A method according to claim 36 wherein the power contained in the higher repetition rate pulses is substantially equal to the power of the initial pulsed light beam.

49. Apparatus for exposing a pattern on a photosensitive surface comprising:

a laser light source providing a beam formed of successive substantially instantaneous laser pulses separated by a time interval;

a data signal source that provides data signals;

a modulator that receives the beam and the data signals and selectively modulates the beam with a modulating signal responsive to the data signals for a time period longer than said time interval, such that the modulating signal is operative to modulate at least two successive pulses; and

an optical subsystem that receives the modulated beam and projects an image of the modulator onto a photosensitive surface to expose a pattern thereon according to said modulating signal,

wherein the modulating signal is an acoustic wave and wherein an attribute of the modulating signal changes between at least some of the two successive pulses.

50. Apparatus according to claim 49 wherein the modulator is an acousto-optical modulator.

51. Apparatus according to claim 49 wherein the modulator has a defined length, and the attribute is the length of the acoustic wave in the modulator.

52. Apparatus according claim 51 and wherein the shape of a spot formed by a pulse in the beam, as projected by the optical subsystem, is at least partly defined by the length of the acoustic wave in the modulator.

53. Apparatus according to claim 51 and comprising a scanning subsystem for scanning the image of the modulator along the photosensitive surface.

54. Apparatus according to claim 53 wherein the acoustic wave propagates in the modulator at a first velocity having a first rate of propagation and a first direction, and the image of the modulator is scanned across the photosensitive surface at a velocity that is related to the velocity of propagation of the acoustic wave, but in the opposite direction.

55. Apparatus for exposing a pattern on a photosensitive surface comprising:

a laser light source providing a beam formed of successive laser pulses; and

a modulator selectably modulating the beam to provide a multiplicity of pulses available to write a pattern, wherein at least some of the pulses available to write a pattern have different spatial shapes; and

a scanner to scan the multiplicity of pulses available to write a pattern onto a photosensitive surface to form a pattern thereon.

56. Apparatus according to claim 55 and wherein the laser light source is a mode-locked laser.

57. Apparatus according to either claim 55 and wherein the modulator is an acousto-optical modulator.

58. Apparatus according to claim 57 the spatial shape of a pulse is defined by an acoustic wave in the modulator.

59. Apparatus according to claim 58 and wherein each pulse available to write a pattern exposes a spatially defined region on the photosensitive surface.

60. Apparatus according to claim 59 and wherein at least some spatially defined regions mutually overlap each other.

61. Apparatus for recording an image on a photosensitive surface, comprising:

a pulsed light source that produces pulsed light having a first wavelength and a pulsed repetition rate;

a wavelength converter external to the pulsed light source that receives said pulsed light and outputs wavelength converted pulsed light having second wavelength which is less than the first wavelength;

a modulator that receives the wavelength converted pulsed light and modulates it at a data rate; and

a scanner that scans the modulated wavelength converted pulsed light over the surface.

62. Apparatus according to claim 61 and wherein the pulsed light source is a laser.

63. Apparatus according to claim 62 and wherein the pulsed light has a first wavelength in the IR spectrum.

64. Apparatus according to claim 63 and wherein the wavelength converter is a non-linear medium.

65. Apparatus according to claim 64 and wherein the pulsed light source comprises a laser cavity and the non-linear medium is external to the laser cavity.

66. Apparatus according to claim 65 and wherein the wavelength converted pulsed light has a wavelength which is in the UV spectrum.

67. Apparatus according to claim 61 and wherein the wavelength converted pulsed light has a wavelength which is in the UV spectrum.

68. Apparatus according to claim 65 and wherein the non-linear medium is an LBO crystal.

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69. Apparatus according to claim 61 and wherein the pulse repetition rate is less than the data rate.

70. Apparatus according to claim 61 and wherein the pulse repetition rate is multiplied by a pulse repetition rate multiplier.